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ABSTRACT

Presented are four research papers on computer based resource units (CBRUs) which are relevant to special education (SE). J. Eisele explains computer use for curriculum development and instructional management by describing the problem, objectives, and procedures, and by giving conclusions. The system is said to involve teacher selection of objectives and completion of a student profile, and computer production of resource guides consisting of four sets of suggestions for each objective and lists of activities and materials. An appendix includes learner variables, teacher decision-making variables, a CBRU schema, and a list of resource units (eight units are starred for SE use). K. Cross summarizes four studies on CBRU use for developing critical thinking skills, developing positive attitudes toward mathematics, using objectives of understanding to increase students' knowledge, and using a precoded resource guide for a U.S. Constitution unit, and concludes that there are no quantitative losses and some quantitative gains from CBRU use. T. Clayback summarizes two studies on effects of computer assisted planning on teacher behaviors and reports results such as teachers using a resource guide preplanned more and developed better planning ability than teachers not using the guide. Discussed by G. Biapchi and D. Burr are ways CBRUs enhance curriculum research and evaluation strategies. The authors examine teaching-learning components, and summarize completed and ongoing studies to illustrate CBRU use. (HC)

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RESEARCH ON COMPUTER BASED RESOURCE UNITS

A Compendium of Papers

Presented to the American Educational Research Association

March 5, 1970

by

James E. Eisele
Kenneth A. Cross
Thomas J. Clayback
Bruce D. Burr
Gordon Bianchi

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THE COMPUTER AS A TOOL FOR CURRICULUM DEVELOPMENT AND INSTRUCTIONAL MANAGEMENT

by

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A Paper Presented to the
American Educational Research Association
March 2-6, 1970
Minneapolis, Minnesota

THE COMPUTER AS A TOOL FOR CURRICULUM DEVELOPMENT AND INSTRUCTIONAL MANAGEMENT

J. E. Eisele

Problem

The project reported in this paper addressed itself to the problem of using the computer to help classroom teachers preplan an individualized program of instruction. Teachers are, after all, expected to provide a curriculum which is relevant to the learner, important to society, appropriate in terms of learning theory, and of significance to the various disciplines. A monumental task, at least, and one with which teachers have received little help in the past.

In order to investigate possibilities in this area we posed questions which were central to the problem. Namely, we sought answers to the following:

1. What processes are employed by the expert classroom teacher in making decisions about individual teaching learning situations?
2. What variables must be considered in making decisions about teaching and learning plans?
3. Can the computer be used to augment the decision making powers of the classroom teacher?

The job of the teacher seems clear in some respects. He is expected to provide learning opportunities for each student which are in keeping with the needs of the individual. He must select these opportunities either from his own experiences or from these in combination with other data sources. The individual programs must account for a host of variables which at present are hypothesized to be related to the learning process. Examples of these variables would be learning rate, learning styles, interests, cognitive stages, and sex.

Another expectation of the teacher is that the individualized curriculum is significant in terms of the discipline and is organized for optimum learning conditions. This adds considerably to the complexity of the decision-making

function of the teacher. In all, the operations necessary to satisfy the requirements mentioned, and countless more could no doubt be added, are sufficient to stagger the imagination. To get a rough quantitative estimate of the proportion of the task, consider only the number of behavioral objectives which would need to be written for such a program. Eisner[1] has estimated as many as 4,200 per year. This has been questioned as a bit too high, but Sullivan's[2] estimate of 9-12 objectives for six or seven classes per day is still immense.

Objectives

The objective of this project was to discover an effective means by which teachers could have available sufficient data to make decisions in order to preplan individual teaching-learning situations. More specifically, we sought to determine the kinds of decisions teachers must make to preplan an individual teaching-learning situation, what variables they must consider in the process, and what the outcome of the decision-making should be. Next we hoped to be able to conceptualize the teaching-learning process in order to provide a framework upon which a model could be developed. Finally, it was our intention to apply automated procedures to the system either in whole or in part.

Any system we were to develop had to support the functions of the classroom teacher, save him time, and assist him with the more routine decision-making functions. In addition, it was felt that the system should ultimately allow teachers to improve the quality of their decisions to permit more effective learning. It had to be, in brief, a self-renewing system.

Definitions

Before going any further into a discussion of our procedures, it seems prudent to define some terms as we employ them. Hopefully, these will not differ significantly from common usage.

We view the curriculum as the planned experiences designed to enable learners to achieve the goals of the school. Stated slightly differently, the term curriculum refers to all the teaching-learning situations planned for providing learners with experiences which will encourage the development and practice of behaviors which the school is interested in fostering.

Looking at curriculum in this light, we view instruction as the actual employment of the planned procedures or the development of the teaching-learning situations with the students. Management, then, can be used to refer to the techniques by which the teaching-learning situations, and their essential components, are organized for maximum utility. But, what are the essential components of the teaching-learning situation.

In terms of managing a teaching-learning situation we think only of those elements which are essential to the process and which are common to all teaching-learning situations. Again, nothing is original about our definition, many authors having adopted similar paradigms[3]. The components, then, are the instructional objectives, subject matter, activities or procedures, materials and evaluation. Each of these components has been dealt with extensively in the literature.

Procedures

The initial procedure in the development of the computer retrieval system was, of course, to specify the exact desired objectives for the system. To do this, the project staff differentiated between the desired functions of the teacher and those of the computer in terms of decisions which must be made in order to preplan a series of teaching-learning situations. The following breakdown has been reported by Harnack[4].

The teacher's functions were four in number:

1. To identify the subject of the teaching unit and the basic unifying theme which would serve as the center of interest in the classroom during

a specific period of time.

2. To define the student's abilities, needs, characteristics, and interests, as these items relate to the selections to be made within the total unit.

3. To suggest possible learning outcomes in the form of behavioral skills, understandings, information, and peripheral objectives which may reasonably be expected to result from the teaching-learning situations developed throughout the unit.

4. To make, if deemed necessary, certain professional decisions related to those tasks or areas which the teacher deems important for the objectives and the students in the classroom.

On the other hand, the electronic computer had to satisfy the following functions:

1. To provide the teacher with a subject-matter outline or problem census related to the learning outcomes identified by the teacher.

2. To suggest a significant number of large-group introductory and developmental and culminating activities.

3. To suggest a significant number of introductory and developmental small-group activities.

4. To suggest a significant number of individual learning activities which might prove to be helpful.

5. To suggest suitable instructional materials, including reference materials, for individual students.

6. To suggest appropriate equipment, audiovisual materials, and the like, for large-group and small-group instruction.

7. To suggest suitable references and other materials for the use of the teacher.

8. To suggest how achievement of these proposed outcomes may be evaluated.

9. To suggest 'leads' to other related units (continuous activities) which might grow out of the proposed unit.

The teaching model around which the program was built can be roughly summarized here. According to this model the teacher first determines an area of interest around which several related teaching-learning situations can be developed. He then selects or identifies the specific behavioral objectives, related to the topic, which the learners can reasonably be expected to achieve based upon their needs. From some reservoir of ideas, then, the teacher selects items related to objectives held in common to all for large-group instruction. These items include the subject-matter materials, procedures, and evaluative criteria. The screen for selection of these items in this case being the selected objective. There is no reason why, if the criterion for selection (the objective) is known, the related items cannot be stored and retrieved when the objective is called for.

The next step in the model is to identify the characteristics of individual learners which should serve as screens in selecting items related to an objective for a specific learner. Given an objective, for example, for which several items of instruction are appropriate the teacher will select those which are most suitable for a specific individual. To illustrate: Of several books related to a given objective the teacher would select the ones which the learner could read, or which match his reading level.

Programs were written which employed the objectives and variables, called learner characteristics, as screens. A complete breakdown of these variables is not possible here but is included in the appendix of this paper. A third screen was also developed to permit teachers to exercise their judgement in selecting items which were in keeping with factors relevant to special knowledge about teaching, such as methods of instruction, types of objectives, and types

or kinds of instructional materials. These we called professional decision-making variables, and they are also listed in the appendix of this paper.

To operationalize the system, items were written for each component within the framework of units which were commonly taught in elementary school or high school. Behavioral objectives, subject-matter broken into short statement or in outline form, suggested instructional procedures, materials and references, and evaluation procedures were written. Each item is assigned an identifying numeral and symbol. For example, OB 17 refers to objective number 17, and SM 34 refers to the item of subject-matter numbered 34. Each item of subject-matter, instructional activity, material and evaluation device is then "coded" by specifying the numerals of the objectives to which each relates. For example, MA 13-2, 7, 44 means that material number 13 is appropriate for objectives numbered 2, 7, and 44 in the unit. Incidentally, topics are also assigned identifying numerals.

Each item, including the objectives, is then coded to the learner and professional variables by indicating the variable number to which the item relates. For example, OB 17-143 means that objective number 17 has been classified as a knowledge objective according to the Taxonomy. At present there are a total of 260 variables to which an item could be related.

To use the system the teacher selects the desired objectives from a listing for the topic requested. The teacher also completes a profile sheet on each learner. The computer then provides four sets of suggestions for each objective chosen. The suggestions consist, again, of subject-matter, materials, activities, and evaluation techniques. The first set of suggestions, labeled Part A in the diagram in Appendix III, lists the suggestions for each objective for the individual learner with his name appearing at the beginning of the listing. Part C provides a list of all the activities and materials suggested in the unit.

Part D contains suggestions for small group activities where some objectives are common to only a few students. The combined sets of suggestions are called Resource Guides.

There is no prescribed method for using a Guide. Some suggestions are provided, however, and most users follow a similar procedure. They must first do some further preplanning from the suggestions provided. This requires the organization of the suggestions into weekly, daily, and periodic plans, and the times in which learners will work independently. To do this, the teacher might begin by selecting objectives for large and small group instruction from the Guide. A form is provided for specifying these plans according to the objective and day. Several days and/or objectives may be planned at one time. Also on this form the teacher may identify the days and times to be set aside for individual work on the unit. At this same time, the teacher begins preplanning the individual work. Another form is provided on which can be indicated the activities and materials for as many objectives as the teacher wishes to specify in advance. In some cases, preplanning for an individual pupil may involve a single objective at a time. In other cases, the student may experience longer range planning and may be expected to organize his time for long periods. This form may be attached to the individual printout and use for record-keeping purposes,

As soon as face-to-face interaction between teacher and pupils begins, it is desirable to involve the learner in as much planning as possible. Of course, they have probably already been involved in the selection of objectives and other preliminary planning. At this point they can profitably be involved in finalizing their individual and group plans with frequent opportunities for revision as they proceed through the unit.

The system is refined through a continuous source of feedback. The data bank is stored on magnetic tape and a matching tape collects feedback information about the items in a unit. Periodically, according to volume of use, the feedback

tape provides data which indicates appropriate alterations to the unit. Changes are made in the master tape to either add to, delete, or alter items as confirming data is received from various sources which will be referred to later.

It must be remembered that the total system is based upon considered, and not experimentally tested, hypotheses. They are now, however, in testable form as will be indicated in another paper. Rather than disregarding untested procedures, this system provides a framework for their examination. The results of the experimentation is one valuable source of feedback; another source is the classroom teachers using the system. Many valuable suggestions come from these users.

Implications

The possibilities of this system seem unlimited. Some of the more salient ones will be mentioned here.

First, this system can save countless hours of preplanning. However, this economy is really mythical. Ideally, the system makes many decisions of selection and matching which the teacher no longer has to do. There is reason to doubt that teachers ever made all these decisions, but if they did, and we believe they should, much time would be saved.

Next consider the tremendous value of the data bank. We all know of Popham's newly-developed supply of behavioral objectives. Altogether, we now have over five thousand objectives and they are "taxonomized" and coded to a large number of other variables. In addition, we have countless items of subject-matter, instructional procedures, materials, and evaluation devices also coded to the variables and related to the behavioral objectives. Harrick[5], long ago, stated that:

> Perhaps the most critical and central concept related to the teaching operations is the idea of the organizing center. As "the point where all the important aspects of the teaching act can be related and given focus," its effect on the quality of instruction cannot be denied.

Another implication must deal with the whole concept of individualizing instruction. To vary instructional plans for a single objective requires tremendous knowledge and resources which most teachers simply do not have available. To also vary the objectives for individual students is almost more than anyone should expect of a teacher. This system can help by providing much of the necessary data for planning such an individualized program. We are not far away from having a pupil data file which will keep records on both learner characteristics and achievement. That way the file can be useful to both assist in the selection of objectives and as a screen for selecting individual programs of instruction.

Finally, let me allude again to the research framework of the system. We view all combinations of a Resource Guide as researchable hypotheses. Does treatment X result in condition Y and, if so, under what conditions? Does sex, age, etc. have any bearing on instructional decisions for specific objectives? The whole question of sequence and scope are researchable within this framework. Another paper will deal with this topic, but its significance bears this repetition.

Conclusion

The system described here has been used successfully to assist classroom teachers in individualizing instruction. It has demonstrated to us that some, although certainly not all, of the decision making processes of the classroom teacher can be augmented with electronic data processing equipment. Further, we are satisfied that such augmentation enables the teacher to consider many variables when preplanning individual programs which could not be considered without such assistance.

Many questions remain to be answered. Ultimately, the system must be judged in terms of learning outcomes and we are constantly seeking data along

this line. Also, however, we must judge its effectiveness in terms of making curriculum and instruction more functional, assuming equal achievement on the part of learners. We are also gathering data in this direction and are most optimistic about the assistance which teachers are receiving from the system. We must continue to investigate the nature of the teaching-learning process and the kinds of processes necessary to preplan units of instruction. An expecially challenging and interesting area of research in connection with the system is the relevance of learner characteristics to teaching and learning. We are only beginning to touch upon these variables.

In conclusion, while recognizing many of the limitations of the system and while continuing to seek better approaches, we believe this project contributes much to a concern which has been described by Goodlad:

> If individualizing instruction is to become more than a slogan, data to guide diagnosis, information on the consequences of decisions, and data to facilitate reassessment are essential. The quantities and varieties of data to be stored and retrieved, to say nothing of the manipulations of these data to be performed, defy human capabilities. We are now beginning to envision for the teacher a highly professional role of diagnosing and prescribing for the learner. But this role may never be fulfilled unless the computer is brought meaningfully and productively into these sensitive, often intuitive acts, as supplier of essential data and as predictor of certain possible consequences of choice. As yet this fertile soil has been scarcely gazed upon.

References

1. W. James Popham, et al. Instructional Objectives. Chicago: Rand McNally & Company, 1969, p. 14.

2. Op. Cit., p. 55.

3. See especially Ralph Tyler, Basic Principles of Curriculum and Instruction. Chicago: University of Chicago Press, 1950; Hilda Taba, Curriculum Development, Theory and Practice. New York: Harcourt, Brace & World, Inc., 1962.

4. Robert S. Harnack,"Resource Units and the Computer,"; The High School Journal. December, 1967. p. 127-128.

5. John I.Goodlad, et. al., Application of Electronic Data Processing Methods in Education. Cooperative Research Program, U.S. Office of Education, Project No. F-026, University of California, Los Angeles, California, January, 1965.

LEARNER VARIABLES

Student's Name_____ Teacher's Name_____

Unit Title_____

OBJECTIVES

_____ _____ _____ _____

GENERAL INTEREST

1	Philosophy	2	Psychology
3	Logic	4	Morals
5	Religion	6	Political Science
7	Economics	8	Law
9	Education	10	Commerce
11	Everyday Experiences	12	Folklore
13	Language	14	Astronomy
15	Chemistry	16	Earth Science
17	Mathematics	18	Physics
19	Anthropology	20	Biological Science
21	Engineering	22	Agriculture
23	Domestic Science	24	Other Places
25	Animals	26	Famous People
27	Natural Phenomenon	28	Creating and Construction
29	Fine Arts	30	Photography
31	Biography or Autobiography	32	Drama
33	Fiction	34	Poetry
35	Geography	36	History
37	Sports/Leisure	38	Social Science
39	Physical Science	40	Natural Science
41	Humanities	42	Music
43	Art	44	Creative Writing
45	Adventure	46	Non-Fiction
47	Early Days	48	Modern Wonders
49	Old Tales	50	Fun
51	Automobiles	52	Transportation

OCCUPATIONAL INTERESTS

53	Industry	54	Communications
55	Transportation	56	Homemaking/Home Nursing/Child Care
57	Food/Agriculture	58	Finance
59	Business/Office	60	Sales/Marketing
61	Recreation/Travel	62	Service
63	Construction	64	Arts & Entertainment
65	Science/Research		

SOCIAL CLASS

66	Lower/Lower	67	Upper/Lower
68	Lower/Middle	69	Upper/Middle
70	Lower/Upper	71	Upper/Upper

LEARNER VARIABLES

Student's Name_____

SEX

72 Male

73 Female

DEVELOPMENTAL TASKS

74 Learning Physical Skills Necessary for Ordinary Games
75 Building Wholesome attitudes Toward Oneself as a Growing Organism
76 Learning to Get Along with Age-Mates
77 Learning an Appropriate Masculine or Feminine Social Role
78 Developing Fundamental Skills in Reading, Writing and Calculating
79 Developing Concepts Necessary for Everyday Living
80 Developing Conscience, Morality, and a System of Values
81 Achieving Personal Independence
82 Developing Attitudes Toward Scoial Groups and Institutions
83 Accepting New and More Mature Relations with Age-Mates of Both Sexes
84 Accepting One's Physique (Male and Female Role)
85 Achieving Emotional Independence from Parents and Other Adults
86 Achieving Assurances of Economic Independence
87 Selecting and Preparing for an Occupation
88 Developing Intellectual Skills and Concepts Necessary for Civic Competence
89 Desiring and Acieving Socially Responsible Behavior
90 Preparing for Marriage and Family Life
91 Acquiring A Set of Values and Ethical System as a Guide to Behavior

READING LEVEL

103	Non-Reader	104	Pre-Primer
105	Primer	106	1
107	1.5	108	2
109	2.5	110	3
111	4	112	5
113	6	114	7
115	8	116	9
117	10	118	11
119	12	120	Above 12

MENTAL AGE

194	.5	195	1.0
196	1.5	197	2.0
198	2.5	199	3.0
200	3.5	201	4.0
202	5.0	203	6.0
204	7.0	205	8.0
206	9.0	207	10.0
208	11.0	209	12.0
210	13.0	211	14.0
212	15.0	213	16.0
214	17.0	215	18.0
216	19.0	217	20.0
218	Above 20		

LEARNER VARIABLES

Student's Name_____

CHRONOLOGICAL AGE

219	.5	220	1.0
221	1.5	222	2.0
223	2.5	224	3.0
225	4.0	226	5.0
227	6.0	228	7.0
229	8.0	230	9.0
231	10.0	232	11.0
233	12.0	234	13.0
235	14.0	236	15.0
237	16.0	238	17.0
239	18.0	240	19.0
241	20.0	242	21.0

PHYSICAL HANDICAPS

243	Blind	244	Partially Sighted
245	Deaf	246	Hard of Hearing
247	Gross Motor Disability	248	Fine Motor Disability

RESIDENTIAL STATUS

252	Residential	253	Non-Residential

BODY AREA

254	Head, Neck, Shoulders	255	Arms
256	Trunk, Lungs	257	Legs, Feet

LEARNING ENVIRONMENT

258	Classroom	259	Outdoors
260	Gymnasium		

PROFESSIONAL DECISION MAKING VARIABLES

Teacher's Name_____ Unit Title_____

OBJECTIVES

___ ___ ___ ___ ___

___ ___ ___ ___ ___

MAJOR SOCIAL FUNCTION

92 Governing
93 Communciating
94 Transporting
95 Producing
96 Consuming & Conserving
97 Heritage
98 Cooperating
99 Leisure
100 Earning a Living
101 Educating
102 Spiritual/Moral

INSTRUCTIONAL ACTIVITY

121 Teacher Activity
122 Dramatization
123 Verbal
124 Non-Verbal
125 Problem Solving
126 Reading
127 Field Trips
128 Writing
129 Listening
130 Speaking
131 Constructing/Creating
132 Laboratory
133 Drill Practice
134 Physical/Tactile
135 Lecture
136 Teacher Led Discussion
137 Student Led Discussion
138 Recitation

SUGGESTED APPROACH

139 Introductory Activity
140 Developmental Activity
141 Culminating Activity
142 Extra-Curricular Activity

OBJECTIVES

143 Knowledge
144 Comprehension
145 Application
146 Analysis
147 Synthesis
148 Evaluation
149 Receiving
150 Responding
151 Valuing
152 Organization
153 Characterization by a Value
154 Psychomotor

MATERIAL DESCRIPTOR

155 Audio
156 Visual
157 Audio-Visual
158 Verbal
159 Non-Verbal
160 Printed
161 Programmed Instruction
162 3-D Material/Laboratory
163 Resource/Places?People

PROFESSIONAL DECISION MAKING VARIABLES

MATERIALS

164 Books
165 Vertical File Material
166 Films
167 Film Strips
168 Resource People
169 Resource Places
170 Charts
171 Maps
172 Black Board Design
173 Bulletin Board Design Materials
174 Opaque Projector Material
175 Overhead Projector
176 Sponsored Materials
177 Programmed Materials
178 Tapes
179 Records
180 Slides
181 Art Materials

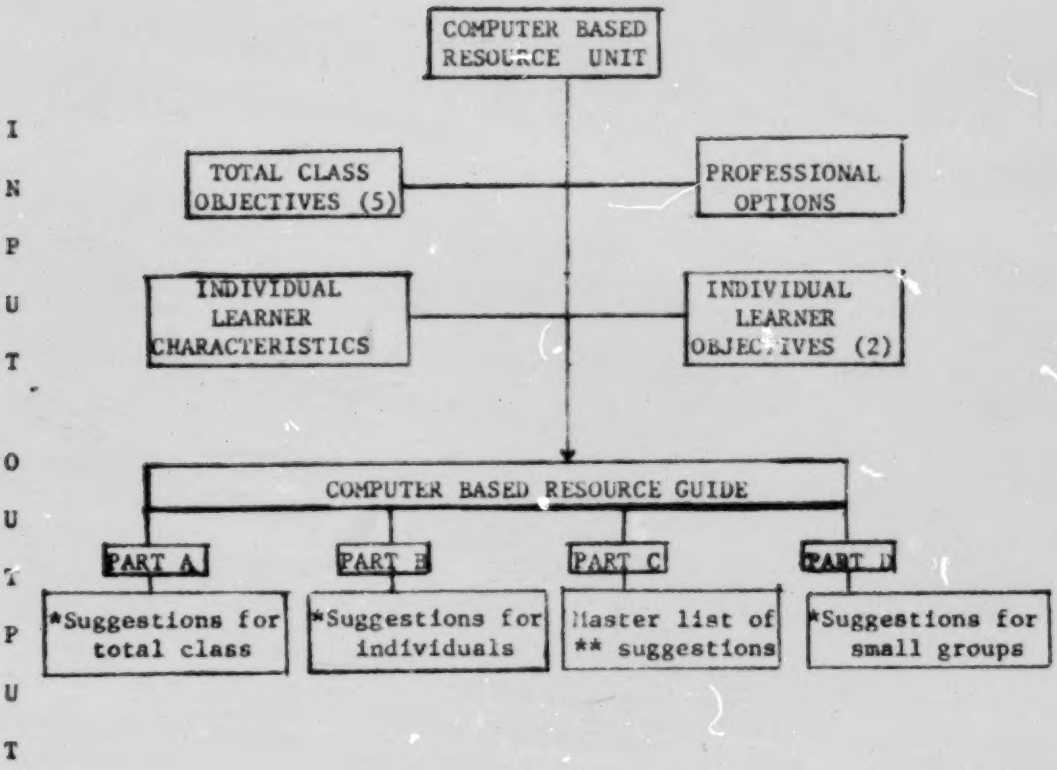
INSTRUCTIONAL GROUPING

182 Student Activities (Individual)
183 Small Group Activity
184 Large Group Activity

EVALUATION DEVICES

185 Standardized Test
186 Paper/Pencil Essay
187 Paper/Pencil Objectives
188 Rating Scale
189 Checklist
190 Log Diary
191 Self-Evaluation
192 Creating and/pr Construction
193 Selective Observation

Diagram of CBRU Schema

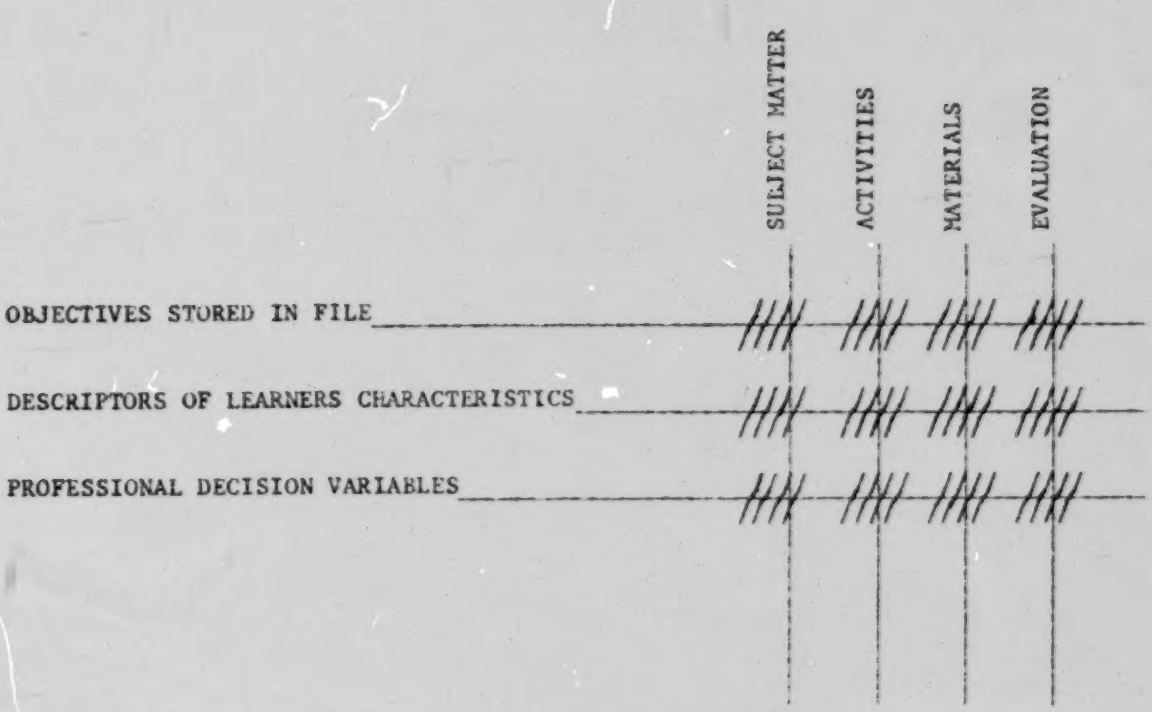


A Computer-Based Resource Unit Consist of thousands of suggestions* for instructional strategies. Each of the suggestions if "coded" to the objectives in that particular unit as well as appropriate learner characterisitcs and professional variables. This coding acts as a screening device so that a classroom teacher will receive only those suggestions relevant to her particular students and situation.

*Suggestions include: Objectives, content outline, activities, instructional materials, and measuring devides.

** Suggestions: Part C contains only content and materials.

CODING FORMAT



Objectives chosen by teacher

Subject Matter

Activities

Materials

Evaluation

Appendix IV

LIST OF UNITS

	UNIT TITLE	GRADE LEVEL
1	Movigenics *	All Ages
2	The Communities of Man	K-6
3	Sex Education *	K-9
4	Market Place	1-4
5	Solar System and Beyond	1-6
6	Speaking and Listening *	1-6
7	Transportation	2-3
8	Communication	2-3
9	Niagara Frontier	2-3
10	Foods	2-3
11	Conservation of Natural Resources	4-6
12	Man and His Culture	4-6
13	Smoking	4-6
14	Indian Culture *	4-6
15	Measurement *	4-8
16	News Media Analysis	4-8
17	Air Pollution	6-8
18	Living in the Space Age	7-9
19	Drugs and Narcotics	7-12
20	Quadratic & Trigonometric Functions	8-10
21	U.S. Constitution	9-11
22	Manifest Destiny	9-11
23	Job Interviewing *	9-12
24	Metropolitanism	9-12
25	American People	10-12
26	American Civilization in Historical Perspective	10-12
27	Transportation's Influence on American History	10-12
28	World War II	10-12
29	American Cultural Revolution in the 20th Century	10-12
30	Movement Behavior *	All Ages
31	Going To & From School * (For Trainable Students Only)	

* Indicates Units Especially Adapted for Special Education

REVISED OBJECTIVES

Resource Unit: TRANSPORTATION'S INFLUENCE ON U.S. DEVELOPMENT

1. To outline the population trends observable in the United States over the years.
2. To analyze the impact of technology on the transportation industry.
3. To outline the areas of interdependence among the urban, suburban, and rural areas of the nation.
4. To describe the economic structure and organization of the transportation industry.
5. To analyze the economic consequences of extreme division of labor.
6. To analyze the consequences of extreme division of labor on our society and its members.
7. To analyze the effects of improved transportation on the leisure time available to individuals and the way they use their leisure.
8. To list the problems faced by workers and managers of the transportation industry.
9. To analyze the ways in which transportation has made the labor force more mobile.
10. To analyze the effects of weather, geography, and other environmental factors on transportation.
11. To analyze the relationship between the functions of the urban area and the structure it has assumed.
12. To list the criteria used for evaluating a transportation system, with special emphasis on the evaluation of the presently existing transportation facilities on the immediate area.
13. To know transportation's influence on present day economic development.
14. To know transportation's influence on present day social developments.
15. To know the dependence of the national economy on transportation and industry today.
16. To know government's role and influence on transportation today.
17. To know safety problems in transportation today.
18. To define planned obsolescence.
19. To know government's role in control and supervision of transportation for individual and national interests today.
20. To know how air and space transportation in modern America presents new frontiers.
21. To know the major changes in all areas of American life affected by the automobile.
22. To know the problems of urban decay.
23. To know basic facts about one of America's major problems -- traffic congestion.
24. To know how man's transportation systems may support the growth of megalopolis.
25. To identify the major modes and functions of transportation during the pre-Columbian period of American history.
26. To know the modes and functions of transportation in the discovery and exploration period of American hisotry.
27. To analyze the effects of transportation on the struggle for American independence.

Resource Unit: TRANSPORTATION'S INFLUENCE ON U. S. DEVELOPMENT

28. To know the influence of transportation on the development of colonial America.

29. To trace those unique patterns of colonial evolution arising from differences in transportation difficulties among colonies.

30. To describe the modes and functions of transportation during the period of westward expansion prior to the Civil War.

31. To identify those developments in transportation which contributed to sectional difficulties before the Civil War.

32. To analyze the effects of transportation on the character of American Society prior to 1860.

33. To analyze the relationships between developments, i.e., transportation and developments in American economic patterns prior to 1860.

34. To trace the technological developments in transportation prior to 1860.

35. To explain the relationship between transportation developments and the strategy and outcome of the Civil War.

36. To describe those factors arising from developments in transportation which served to further national unity following the Civil War.

37. To know the individuals who made major contributions to transportation during the "gilded" age.

38. To trace the economic development of the transportation industry during the last half of the 19th century.

39. To explain the effect of transportation on U. S. economic development in the last part of the 19th century.

40. To explain the influence of transportation on the social development of America in the last half of the 19th century.

41. To know the technical improvements made in transportation in the last half of the 19th century.

42. To explain the role of the federal government in assisting and ultimately attempting to regulate the transportation in the last half of the 19th century.

43. To know the social developments which were influenced by the transportation industries before World War I.

44. To explain the influence of the transportation industries on America's economic development before World War I.

45. To know the importance of transportation in the development of our foreign policy before World War I.

46. Reserved.

47. To explain how the two world wars contributed to expansion and development of modern transportation.

48. To explain how transportation has influenced present day foreign policy.

A SUMMARY OF RESEARCH RELATED TO STUDENT LEARNING OUTCOMES RESULTING FROM USING COMPUTER ASSISTED PLANNING

by

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INTRODUCTION

Educational literature is replete with studies designed to measure differences accruing from the use of various teaching strategies, instructional materials, or planning materials. The most significant generalization which has emerged from such studies is that they have not shown significant differences. Those of us associated with computer assisted planning have not been remiss in generating our share of such studies.

In this paper, four such studies will be reported. In each, there emerge many instances of positive gains resulting from the use of computer assisted planning. In most cases, however, these tendencies do not reach an acceptable level to be regarded as statistically significant. Thus, the strongest statement we can make regarding the impact of computer assisted planning on student learning is that learning is not decreased when computer assisted planning is used. The cold hearted researcher is likely to be unimpressed by such a generalization. However, the studies seem important on three counts; these are:

1. In almost all comparisons of computer assisted planning with other methods, gains in learning are either equal or positive in relation to the control groups; using computer assisted planning, there are no quantitive losses and there are some quantitative gains.
2. As the next paper suggests, there may be qualitative differences in learning, resulting from improved planning and teaching, which do not lead to quantitative gains; the learning which does occur may be more relevant to the needs of the learner.
3. The weaknesses in the studies to be presented here should provide clues leading to improved studies of similar types in the future; i.e., longitudinal studies are needed using more sophisticated measures of achievement.

STUDY I

USING RESOURCE GUIDES TO TEACH THE SKILLS OF CRITICAL THINKING

The purpose of this study is to identify the effects on pupil achievement of critical thinking skills of using resource guides as an aid to unit teaching. Three questions were central to the study:

1) Will students whose teachers use resource guides do better on a test of critical thinking than students whose teachers use resource units?

2) Will students whose teachers use resource guides with critical thinking objectives do better on a test of this skill than students whose teachers use resource guides with objectives not related to critical thinking?

3) Will students whose teachers use resource guides have a greater variance of scores on a test of critical thinking as evidence of more individualization of instruction than students whose teachers use resource units?

The investigator used an experimental design to compare the following groups:

1A - Students whose teachers used resource guides with critical thinking objectives.

2A - Students whose teachers used resource guides without critical thinking objectives.

1B - Students whose teachers used resource units.

Eleven teachers of eleventh grade social studies were selected and assigned randomly to treatment groups. Before they received the resource materials for the unit U.S. Constitution, the pupils were pre-tested with the Watson-Glaser Critical Thinking Appraisal. After they used the materials, the pupils were post-tested with another form of the same test.

Total test scores and subtest scores (1) Inference, (2) Recognition of Assumptions, (3) Deduction, (4) Interpretation, and (5) Evaluation of Arguments were tested with an analysis of covariance. Where differences existed, the Scheffe Test of multiple comparisons was used to locate differences.

An F Test compared variances for differences between pre-test and post-test for each group.

Adjusted mean score differences favored students whose teachers used resource guides with critical thinking objectives over students whose teachers used resource units. The difference (1.3483), however, was not significant at the .05 level of confidence. Nevertheless, the first group gained from having about the same actual mean as the second group on the pre-test to 1.6 above on the post-test.

Adjusted mean scores for the two groups that used resource guides were not significantly different, but the actual means showed greater gain for those having critical thinking objectives.

CONCLUSIONS:

(1) Using the resource guide, as an aid to unit teaching, may help pupils develop skills of critical thinking.

(2) The resource guide can assist in individualizing instruction in teaching critical thinking skills.

(3) The resource guide assists teacher decision making without impairing pupil learning of skills of critical thinking.

STUDY 2

THE USE OF A COMPUTER BASED RESOURCE GUIDE TO PRE-PLAN A UNIT OF INSTRUCTION AND TO DEVELOP STUDENT ATTITUDES TOWARD MATHEMATICS

The development of positive student attitudes toward mathematics is an important educational goal. Theory says the curriculum pre-planning practices of the teacher can foster desirable attitudes by selecting teaching-learning situations specifically oriented to attitude development and by arranging learning experiences based upon individual students' learning characteristics. The computer-based resource guide should facilitate the formation of desirable attitudes because the guide supplies the teacher with pre-planning suggestions per specific goal and per individual learner variables.

This study was designed to determine experimentally whether the computer-based resource guide helps the teacher to prepare a written pre-planned unit of mathematics instruction and whether these learning experiences arranged with the aid of the guide do affect more positive student attitudes toward mathematics.

As regards pre-planning skills, each of four criteria indicative of a good unit of instruction appeared more often in the plans of teachers who used a guide to pre-plan than in the plans of teachers who used a dump (an entire resource unit), as determined by a jury of qualified educators. When quantified, the average of the jurists' ratings for the guide group's plans was greater than the corresponding figure for the dump group's plans for each of the four criteria. In all cases, these differences were statistically significant at the .05 level.

With respect to student attitudes, classroom units, whose teachers selected instructional objectives specifically designed to attain positive attitudes toward mathematics and whose learning experiences were pre-planned with the aid of a guide, achieved greater average attitude measures on a subject preference index, the Aiken scale, and the Dutton scale. Though these trends were consistent, statistically significant differences were not achieved at the .05 level.

In the preparation of a written pre-planned unit of mathematics instruction, teachers aided in pre-planning by a guide exercised a greater degree of decision-making skill in four facets of the pre-planning process: teacher choice of learning experiences per each particular objective to be attained, teacher provision for appropriate small group and individual instruction, teacher organization of a developmental sequence of unit learning experiences, and teacher selection of an appropriate variety of unit learning experiences.

With respect to student attitudes toward mathematics, the trends favored classroom units whose instructional goals were attitude oriented and whose learning experiences were pre-planned by teachers using a guide, but conclusive evidence regarding these trends will require further study.

To obtain more conclusive evidence concerning attitude development, a modified replication of this study should consider: (1) a random sample of larger size, (2) the individual student as the unit for statistical inference, (3) an extended treatment exposure to include several units over at least a semester's time duration, (4) provisions to secure all requested instructional materials, (5) the sole use of teachers who are experienced in unit planning and teaching, (6) a group without and pre-planning aid to contrast guide vs. dump, and (7) a multivariate statistical analysis of a number of attitude measures in addition to a general liking for mathematics.

STUDY 3

THE RESEARCH GUIDE AS AN AID FOR THE TEACHING OF UNDERSTANDING

The teaching and the measuring of learning objectives related to understanding has become amajor concern in education. The term "understanding" has become common in educational circles. Seldom can we examine a list of objectives in a unit or lesson plan without encountering the words "understanding," "comprehension," or their equivalent.

The purpose of this study was to determine the effectiveness of the resource guide in areas related to understanding.

Planning with a resource guide was compared to planning with a resource unit in regard to effective teaching for understanding. The comparisons made between the unit and the guide were relative to the differences which resulted on a measure of understanding related to a teaching unit on transportation. The mean scores of pupils taught by teachers using the resource guide were compared with the mean scores of pupils taught by teachers using the resource unit.

Fifteen classes were selected from the Western New York area and divided into three stratified treatment groups, each of which contained five classes. Two classes in each of the three groups were from suburban schools, two from urban schools, and one from a rural school district.

One group consisted of five classes whose teachers used a resource guide with objectives of understanding. Another group consisted of five classes whose teachers used a resource guide without objectives of understanding. The third group consisted of five classes whose teachers used a resource unit.

The test used in this study was designed by the investigator and measured understanding-type objectives related to transportation. Validity and reliability were determined after intensive testing, re-testing and revision. The Kuder-Richardson formula was used to determine reliability. An item analysis was also made.

The investigation was concerned with three questions:

(1) Will there be a significant difference between the mean scores on a measure of understanding related to transportation between pupils whose teachers used the resource guide with objectives of understanding, pupils whose teachers used a resource guide without objectives of understanding, and pupils whose teachers used a resource unit?

(2) Will there be a significant difference in the mean scores on a measure of understanding related to transportation between pupils who are taught by means of a resource guide and those who are taught by means of the resource unit?

(3) Will there be a significant difference in the mean scores on a measure of understanding related to transportation between pupils who are taught by means of a resource guide and those who are taught by means of the resource unit?

The major conclusions are as follows:

(1) At the .05 level of confidence there was no significant difference between the three groups.

(2) Pupils taught by teachers who used the resource guide with objectives of understanding achieved greater gains in mean scores on a test of understandings in transportation than those pupils taught by teachers who used a resource guide without objectives of understanding and those taught by teachers using a simple resource unit.

(3) Pupils taught by teachers who used the resource guide without objectives of understanding achieved greater gains in mean scores on a test of understandings in transportation than those pupils taught by teachers using a resource unit.

In regard to "comprehension" type objectives, a teacher's decisions regarding these objectives tend to have a strong influence on pupil achievement. In this study, pupils taught by teachers using the resource guide as an aid, achieved understandings which resulted in learnings that enabled them to better translate, interpret, and extrapolate information related to the study of transportation.

STUDY 4

AN EXPERIMENTAL ANALYSIS OF THE EFFECTS ON PUPIL ACHIEVEMENT OF USING AN ELECTRONIC INFORMATION RETRIEVAL SYSTEM IN UNIT TEACHING

The purpose of this study is to determine and analyze the effects of the use of an electronic computer in assisting teachers in pre-planning the teaching of a unit on the United States Constitution.

Questions to be answered:

(1) What difference, in terms of information recall, measured by an objective testing device related specifically to the central theme of study is observable in classes where the teacher is assisted in pre-planning by an electronic computer as opposed to classes where the teacher is not given this assistance?

(2) What difference, in terms of information recall, measured by an objective testing device, constructed to be only vaguely related to the central theme of study, is observable in classes where the teacher is not given this assistance?

Since formal education was made available to children on a mass basis, educators have been faced with the problem of how best to adjust the common needs of the group to the individual needs and interests of learners. One method of approaching this problem has been an attempt to place children in homogeneous groups thereby reducing the range and also the need for individualization of instruction. This method, although commonly used has not proven altogether successful as pointed out by such writers as: Walker, Beck, Cook and Kearney, Shafer and Shoben, and Lee and Lee.

A more profitable approach seems to be an expertteacher combined with the accessibility to a wide range and variety of materials, techniques, procedures and evaluative devices.

Such an approach, however, presents the educator with an enormous task; there arises a serious doubt as to whether teachers possess the time and resources to make such a plan a reality.

Answers to the questions on the preceeding page should assist in determining whether resource guides can facilitate in this complex planning process.

Thirty eleventh grade social studies teachers were randomly assigned to one of three groups.

Group A. Teachers taught a unit on the U.S. Constitution aided by an electronic computer in handling selection of teaching variables from a resource unit which had been pre-coded.

Group B. Teachers taught a unit on the U.S. Constitution using the same resource unit, uncoded, and without benefit of an information retrieval system.

Group C. Teachers taught the topic, U.S. Constitution, without benefit of either the resource unit or the information retrieval system.

A. Science Research Associates -- PRINCIPLES OF DEMOCRACY TEST
This test was seen as being closely related to the central theme of study.

B. The second instrument was created by drawing twenty-one short tests from McGruder's TESTS ON AMERICAN GOVERNMENT.
These tests were selected by expert judges as being least related to the central theme of study.

The hypotheses tested were:

1. The level of performance on a standardized test related to the central theme of study will be significantly greater in the experimental group than in either of the control groups.
2. The level of performance on an instrument designed to test information retention only vaguely related to the central theme of study will be significantly greater in the experimental group than in either of the control groups.
3. The variance of scores in several subtests chosen by expert judges to be "least related" to the central theme of study will be significantly different in the experimental group than in either of the control groups.

Analysis of variance and Bartlett's test for homogeneity of variance were used to establish the validity of the first hypothesis. No significant differences were found to exist on the Principles of Democracy Test, although those differences which did occur tended to favor the experimental group.

Analysis of variance for total test scores and Bartlett's test for homogeneity of variance for total test scores were used for verifying the second hypothesis. Again, differences were not significant for the rejection of the null hypothesis, though gains favored the experimental group. Significant differences were found to exist on fourteen of the twenty-one sub-tests; in all instances, differences favored the experimental group.

Based on these findings, it appears that using resource guides can result in some positive increases in learning both related directly to the unit theme and dispersed from that theme. However, further studies are necessary to confirm these findings.

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A SUMMARY OF RESEARCH RELATED TO TEACHER BEHAVIOR RESULTING FROM THE USE OF COMPUTER ASSISTED PLANNING

by

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A SUMMARY OF RESEARCH RELATED TO TEACHER BEHAVIOR RESULTING FROM THE USE OF COMPUTER ASSISTED PLANNING

by Thomas J. Clayback

INTRODUCTION:

One of the basic goals of curriculum planning is the improvement of instruction. This improvement of instruction hinges on the ability of professional classroom teachers to make the right decision at the right time in planning a teaching-learning situation for individual children. John Goodlad writes:

> The right decision at the right moment is the essence of good teaching. Right decisions are those that time learning perfectly for the individual student. A series of such decisions moves the student forward at an optimum pace. Obviously, such timing and pacing are no more accidental than is the perfect catch by the professional out-fielder. They are, indeed, complex but they can also be acquired. They are attainable only through the dedicated application of a reasonable amount of intelligence, especially in planning. Acquisition of teaching lore is no guarantee of good timing and pacing in teaching, but good teaching is not possible without it. [1]

The following studies indicate some areas in which teacher decision-making has been enhanced through the use of Computer Assisted Planning.

Using A Resource Guide To Preplan A Unit Of Instruction [2]

PROBLEM:

Unit teaching, popular among educators in theory, is not practiced widely in the elementary grades. A number of factors appear to inhibit the unit approach. These include: (1) the complexity of the task of preparing a resource unit, (2) the unavailability of adequate numbers of up-to-date resource units, (3) the lack of time in which to prepare teaching units, and (4) the skill in decision-making required of teachers in preplanning.

The purpose of the study was to seek answers to three questions:

1. Will there be a difference in the time spent by teachers using a Resource Guide, and those not using a Resource Guide in preplanning a teaching unit?

2. Will there be a difference in observable classroom behavior between teachers who used a Resource Guide, and those who did not use a Resource Guide?

3. To what extent do preplanned teaching units differ among teachers using a Resource Guide and those not using a Resource Guide?

This study explored the use of Computer Assisted Planning in preplanning a teaching unit. Although electronic computers have been applied in many areas of education, they had not previously been used in the field of curriculum planning. This initial investigation sought to determine if computers could assist elementary classroom teachers in unit planning.

PROCEDURE:

Thirty-six primary grade teachers in 20 selected schools in Western New York were assigned to either an experimental or a control group.

As part of the study each teacher completed data sheets describing characteristic variables for each of her pupils, and selected the objectives she wished to achieve with a "Transportation" Resource Unit.

Prior to the preplanning period, the data sheets and objectives of the experimental group were processed in the computer while those of the control group were not. The experimental group received from the computer a print-out, or Resource Guide.

The control group received the "dump," or Resource Unit on "Transportation," as it was stored in the computer.

During a two-week planning period (1) each teacher kept a Time Log, a record of time spent on tasks associated with the preparation of the unit; and (2) each teacher wrote an outline of the unit she had preplanned. Also, each teacher was observed four times by one of a group of seven observers. Two observations were made prior to the preplanning of the unit on "Transportation." Two more observations were made after the preplanning period, during the teaching of the unit.

The observers used an observation instrument devised by Hilliard Jason [3] and adapted for use in this study. Data were taken from the observation records, the Time Logs, and the written plans of teaching units submitted by each teacher.

ANALYSIS OF DATA:

Data were analyzed as follows:

1. Using data from the Time Logs, experimental and control groups were compared in regard to the time spent in preplanning. A t-test was made to compare the means of the means of the groups.

2. Using scores obtained from the observation records, comparisons were made of pre and post observations by an analysis of covariance. A .05

confidence level was adopted.

3. Unit outlines were compared on the basis of their meeting seven criteria.

CONCLUSIONS:

The major conclusions are as follows:

1. Teachers using a Resource Guide require considerably more time to preplan a teaching unit than do teachers not using a Resource Guide.

2. Teachers using a Resource Guide spend more time in those tasks closely allied to the individualization of instruction than do teachers not using a Resource Guide.

3. The use of the Resource Guide significantly influences changes in teachers' instructional behavior in certain dimensions of teaching, and in relation to specific characteristics relevant to unit teaching.

4. Teachers using a Resource Guide exhibit clearer ability to construct a teaching unit than do teachers not using a Resource Guide.

5. Computer Assisted Planning can be utilized in curriculum planning.

6. Existing schedule patterns in the elementary school force teachers to do the greater share of their professional planning at home, during their own time.

Changes in Instructional Behavior of Teachers Who Use Computer Processed Materials Designed For The Individualization of Instruction[4]

PROBLEM:

Individual differences among pupils demand that ways be found which will provide opportunity for teachers to plan and provide learning experiences in accordance with these differences.

The purpose of this study was to seek answers to the following questions:

Does the use of Resource Guides cause a varied selection of teachers to more nearly individualize their instruction by (1) encouraging pupils to engage in independent thinking, (2) creating an accepting atmosphere in the classroom, (3) making appropriate selection and use of instructional materials, (4) making appropriate selection and use of teaching methods, (5) motivating pupils through challenge without threat, and (6) meeting the needs of individuals in the classroom.

PROCEDURE:

Nineteen high school social studies teachers and nineteen third grade teachers in eleven schools in Western New York were assigned to either an experimental or a control group.

Using Jason's Instruction Observation Record adapted for use in public schools by Goldberg, a team of thirteen trained observers recorded pre and post-instructional behaviors for each of the teachers in the sample.

Each teacher was asked to complete data sheets describing relevant characteristics for each of his pupils, and select objectives he wished to achieve during the teaching of the selected unit. Approximately one week before the post-observations were made, the experimental group received a Computer Based Resource Guide.

ANALYSIS OF DATA:

Data were analyzed as follows:

1. The differences between the pre and post mean scores were observed for each of the seven scales on the observation instrument. A t-test was used to test for significance at the .05 level.

2. The differences of change in instructional behavior between the elementary teachers and the secondary teachers were analyzed.

3. The pre-post differences in variety and kind of instructional materials and teaching methods were examined.

THE FINDINGS:

1. In the experimental group composite behavior change was significant at the .05 level and, independent instructional behaviors changed significantly on five out of the seven scales of the IOR.

2. In the control group composite behavior did not change significantly and independent instructional behaviors changed on only one of the seven scales.

3. Difference between gain scores of the experimental and control groups were found to be significant on six of the seven scales of the IOR.

4. The high school teachers' instructional behavior was affected more than that of the elementary teachers.

5. A wider range of instructional materials was used during the post observations and, a reduction in use of chalkboard and texts was evidenced.

7. The median number of student questions and comments moved from 6-10 on the pre-observation to 11-15 on the post.

CONCLUSIONS:

The following conclusions have been drawn within the limitations of the study.

1. There is a difference between the regular instructional behavior of a varied selection of teachers and the instructional behavior of the same teachers recorded at a time when they are following plans that were developed

from Computer Based Resource Guides.

2. Resource Guides significantly affect some dimensions of instructional behavior but fail to produce significant change in other dimensions. The significant changes in instructional behavior of teachers who use Resource Guides are changes that increase the number and improve the quality of the following individualized instruction tasks:

A. Encouraging pupils to engage in independent thinking,

B. Creating an accepting atmosphere in the classroom,

C. Making appropriate selection and use of instructional materials,

D. Making appropriate selection and use of teaching methods,

E. Motivating pupils through challenge without threat,

F. Employing a wider variety of instructional materials,

G. Using a greater number of individual and small group methods of teaching, and fewer large group methods,

H. Encouraging more pupil involvement and interaction.

3. Resource Guides fail to produce significant changes in teachers' sensitivities to the needs of pupils or in their sensitivities to the effects of the physical setting.

In summary, Computer Assisted Planning can, in fact, produce positive changes in some aspects of teacher decision-making. While some teacher behaviors seem to remain unchanged, the implications for future analysis of the complex role of the teacher is clearly evident.

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COMPUTER ASSISTED PLANNING AS A VEHICLE FOR CURRICULUM EVALUATION AND RESEARCH

by

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COMPUTER ASSISTED PLANNING AS A VEHICLE FOR CURRICULUM EVALUATION AND RESEARCH

By

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I. PURPOSE:

The intent of this paper is to describe how the unique characteristics of COMPUTER BASED RESOURCE UNITS (also referred to as Computer Assisted Planning) lend themselves to a wide variety of curriculum research and evaluation strategies.

II. DESCRIPTION OF COMPUTER BASED RESOURCE UNITS:

The development of COMPUTER BASED RESOURCE UNITS is based on the concept that electronic processing equipment can be applied in such a way as to relate preplanning of a teaching - learning situation to the needs and receptive abilities of individual pupils.

In constructing COMPUTER BASED RESOURCE UNITS, groups of interested and expert teachers formulate measurable objectives around a center of interest or unit of instruction such as "The Solar System" or 'News Media Analysis". Next, they designate content, select pertinent materials, and devise instructional activities and evaluation devices. All of the above mentioned components are eventually coded to one or a number of the objectives in the resource unit.

A cross coding process is then utilized to relate these teaching - learning components (objectives, content, activities, materials, and evaluation devices) to various learner variables (introductory activity, developmental activity, etc.).

In cooperation with the teacher, the student selects objectives relevant to his own needs and interests, and supplies the necessary information related to his own learner characteristics or variables. Subsequently, the individual student receives a personally tailored curriculum guide related to a particular unit of study. Concurrently, the teacher receives a similar guide for the total class, consisting of objectives which are considered relevant to the needs and interests of all students in the class. Each objective in these "personal" or "total class" RESOURCE GUIDES is matched to numerous items of content, activities, materials, and measuring devices.

By providing a variety of suggestions for each objective, the user, whether teacher or student, still has considerable latitude in determining how the objectives will be achieved. In other words, <u>ultimate teaching - learning decisions are made by people, not computers</u>.

III. COMPUTER BASED RESOURCE UNITS AS A VEHICLE FOR RESEARCH AND EVALUATION:

Although the primary purpose of COMPUTER ASSISTED PLANNING is the individualization of instruction, the systematic control afforded by the computer over teaching - learning components and over student variables has resulted in an exceptionally valuable medium for curriculum research and evaluation with virtually limitless possibilities.

There is no attempt being made to conclude that research and evaluation conducted through the use of COMPUTER BASED RESOURCE UNITS would be otherwise infeasible. Indeed, there is nothing described here which cannot be accomplished solely with the use of human resources. On the other hand, the unique characteristics of COMPUTER BASED RESOURCE UNITS, and the efficient method of processing information by computer, result in a systematically consistent process whose potential for research is limited only by the imagination of the user. Additionally, this procedure will save literally millions of man hours for the curriculum researcher.

The remainder of this paper will describe more specifically some of these unique characteristics of COMPUTER BASED RESOURCE UNITS. Brief descriptions of completed studies, studies in progress and potential studies will be utilized as examples.

IV. EXPLICATION OF COMPUTER BASED RESOURCE UNITS RESEARCH AND EVALUATION QUALITIES:

The information stored in a COMPUTER BASED RESOURCE UNIT is organized around the components of the teaching - learning situation and is coded for retrieval to a set of learner variables and professional variables. These components and variables are often considerations in educational research and, therefore, the COMPUTER BASED RESOURCE UNIT becomes an effective tool in research and evaluation.

The objectives component for a COMPUTER BASED RESOURCE UNIT has facilitated two recent studies. Bianchi[1] used the objectives component from two units to determine what differences existed when students participated with teachers in the selection and formulation of instructional objectives for a unit of study. The objectives from the COMPUTER BASED RESOURCE UNITS "American People" and 'Drugs and Narcotics" were used as examples of teacher formulated objectives. The investigation asked students to formulate instructional objectives which were then compared with the teacher formulated objectives from the COMPUTER BASED RESOURCE UNIT.

In another study, Burr[2] used the objectives component of a COMPUTER BASED RESOURCE UNIT to determine effects of

student participation in the selection of objectives for a COMPUTER BASED RESOURCE GUIDE which teachers used in pre-planning and teaching a unit of instruction. Teachers alone and teachers with students made selections from the objectives in the COMPUTER BASED RESOURCE UNIT. Among other effects, the amount of student participation in planning other components of the teaching - learning situation was studied.

The COMPUTER BASED RESOURCE UNIT can also be used to isolate a learner variable or a cluster of learner variables to determine the effect of these variables. In a study currently in progress, Sauter[3] has isolated the variables of I.Q., social class, interests, and developmental tasks in an effort to compare the suggestions for the components of the teaching - learning situation made by teachers with those in COMPUTER PRODUCED RESOURCE GUIDES. Some of the RESOURCE GUIDES used in this comparison were produced using each of the above variables alone, and other guides were produced using all four of the variables.

Both the components of the teaching - learning situation and learner variables in a COMPUTER BASED RESOURCE UNIT can be combined to study areas such as critical thinking and understanding. Eisele[4] studied the difference in the skills of critical thinking among students whose teachers used a

COMPUTER BASED RESOURCE GUIDE OR UNIT. Eisele isolated the "critical thinking" objectives in a COMPUTER BASED RESOURCE UNIT so that one treatment received a guide containing only objectives and suggestions related to "critical thinking". Another treatment received a guide containing the "non-critical thinking" objectives and suggestions in the entire RESOURCE UNIT. Licata[5] followed a similar procedure in his study of understanding by isolating the "understanding" objectives in the RESOURCE UNIT, "Transportation".

COMPUTER BASED RESOURCE UNITS also provide a vehicle for the study of teacher behavior, particularly when aspects of unit teaching and planning are being compared. Holden[6], for example, investigated the COMPUTER BASED RESOURCE UNIT concept as an in service aid by furnishing one set of teachers a RESOURCE GUIDE to plan their unit of instruction. These teachers were compared with another set who received no computer materials to aid them in planning. Teachers' behaviors were compared as to use of instructional materials, reaction to pupil's needs, and attitude to students among several factors measured. Goldberg[7] compared the planning decisions of teachers who received a RESOURCE GUIDE with teachers who received a RESOURCE UNIT. For each group, Goldberg studied certain observable behaviors of teachers, time spent in planning, and the degree to which individual

activities were planned and individual materials provided to individual students.

Two characteristics of the COMPUTER BASED RESOURCE UNITS provide additional important research advantages. The first is the variety of grade levels and subject areas which are incorporated in the existing units. Presently, over thirty units of instruction have been generated. They include a wide range of subject areas and topics relevant to general and special education for groups ranging from pre-schoolers up to and including college students. This condition will permit the researcher, regardless of his subject matter or grade level expertise, to select that discipline and that age range with which he is most knowledgable and in which he is most interested.

The second characteristic concerns the invariability of format of the COMPUTER BASED RESOURCE UNITS. Regardless of the subject or grade level of the unit, the format is always uniform, consisting as it does of suggested teaching learning components which are generated as a result of combinations of student variables. This characteristic of "format consistency" is of singular advantage to the researcher who wishes to replicate a study at a different time, or at a different grade level, or with a different subject area. In addition, both experimental and control

groups would receive essentially identical RESOURCE GUIDES in terms of format, even though one of the variables, I.Q. for example, might be serving as a screen for the components of the control group but not for the experimental group.

V. RESEARCH IN PROGRESS UTILIZING COMPUTER BASED RESOURCE UNITS:

A brief description of a few studies in progress which are utilizing COMPUTER BASED RESOURCE UNITS as research tools wholly or in part, will illustrate other possibilities.

McMahon[8] is utilizing the COMPUTER BASED RESOURCE UNITS to determine the extent to which COMPUTER GENERATED RESOURCE GIDES can implement the individualization of instruction in a team teaching situation.

Ordinarily, instructional objectives are considered tools for preplanning unit strategies. O'Connell[9], utilizing the third grade unit "Communities of Man", is attempting to determine a dynamic role for instructional objectives during the actual teaching - learning process.

Koenig[10], in studying the effects of individualized reading activities as science achievement, is utilizing the large group, small group, non-reading and reading activities related to a fifth grade COMPUTER BASED RESOURCE GUIDE on "The Solar System."

Bartoo[11] is gathering data on teacher decision - making related to the in-school and out-of-school activities of students. In order to provide all of the participating teachers and students with the same general orientation to unit teaching, each class initially will be provided any RESOURCE GUIDE it desires. Thereafter, all experimental groups will receive the "Speaking and Listening" RESOURCE GUIDE.

O'Neil[12] is using the unit on "Speaking and Listening" to determine how an intermediate level teacher deals with affect in planning small group activities. Containing over 200 small group activities and nearly 150 affective and cognitive objectives, this unit will serve as a convenient experimental tool.

VI. TEACHER AND TEACHER TRAINING ASSESSMENT:

An area with considerable research and evaluation potential concerns an assessment of the abilities of teachers to formulate high quality objectives, activities, content and measuring devices.

Without extensive probing, certain trends are becoming apparent to those individuals who have been involved in the production and distribution of COMPUTER BASED RESOURCE UNITS. A few of these trends are:

1. Teachers have not developed a great deal of skill in writing objectives which involve the "Application"[13] of skills and concepts.

2. Teachers have not developed a great deal of skill in writing creative and/or original measuring devices.

3. Teachers have not developed a great deal of skill in prescribing instructional activities for exceptional students.

4. Teachers have difficulty designating the extent to which certain instructional activities, evaluation devices, etc. are more apropos for boys or for girls.

The implications of these trends apply to research and to evaluation of teaching and teacher training.

VII. SUMMARY:

This paper describes ways that the unique characteristics of COMPUTER BASED RESOURCE UNITS lend themselves to curriculum research and evaluation strategies by providing a systematic and consistent vehicle for controlling variables, particularly those related to the teaching - learning situation and learner characteristics. Several completed and ongoing studies are presented to cite examples of ways the unique characteristics of COMPUTER BASED RESOURCE UNITS have been used, to illustrate the potential of COMPUTER BASED RESOURCE UNITS, and to suggest other possibilities for future curriculum research and evaluation.

FOOTNOTES:

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2. Burr, Bruce D. "The Participation of Students in the Selection of Objectives For a Computer Generated Resource Guide." Doctoral dissertation in progress, State University of New York at Buffalo.

3. Sauter, Robert. "Effect of Dissimilar Combinations of Learner Variables on Learner Achievement Through Utilization of An Electronic Data Processing Equipment Resource Guide." Doctoral dissertation in progress, State University of New York at Buffalo.

4. Eisele, James E. "Using A Resource Guide to Develop the Skills of Critical Thinking." Unpublished doctoral dissertation, State University of New York at Buffalo. 1966.

5. Licata, William. "The Resource Guide As An Aid For the Teaching of Understanding." Unpublished doctoral dissertation, State University of New York at Buffalo. 1969.

6. Holden, George.S. "Changes In Instructional Behavior of Non Unit Teaching Teachers When Resource Guides Are Used." Unpublished doctoral dissertation, State University of New York at Buffalo. 1966.

7. Goldberg, Minerva J. "Using A Resource Guide to Pre-Plan A Unit of Instruction." Unpublished doctoral dissertation, State University of New York at Buffalo. 1966.

8. McMahon, Edward "Using a Computer Generated Resource Guide to Plan for and Implement Individualization of Instruction in a Team Teaching Arrangement. Doctoral dissertation in progress, State University of New York at Buffalo.

9. O'Connell, Joseph. "A Study of Instructional Objectives As Related to the Dynamics of the Teaching - Learning Situation." Doctoral dissertation in progress, State University of New York at Buffalo.

10. Koenig, Herbert. "The Effect of Individualized Reading Activities on Science Achievement." Doctoral dissertation in progress, State University of New York at Buffalo.

11. Bartoo, Eugene. "Instructional Decisions Related to the Interests of Emerging Adolescents." Doctoral dissertation in progress, State University of New York at Buffalo.

12. O'Neil, Elizabeth. "Teacher Use of Pupil Affect in Planning Small Group Activities for a Speaking and Listening Unit." Doctoral dissertation in progress, State University of New York at Buffalo.

13. Bloom, Benjamin S., ed. "The Classification of Educational Goals. Handbook I: Cognitive Domain." New York: David McKay Company, Inc., 1956.